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09/725,983	11/29/2000	Christopher W. Fraser	777.400US1	1299

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EXAMINER

NAHAR, QAMRUN

ART UNIT PAPER NUMBER

2124

DATE MAILED: 09/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/725,983

Applicant(s)

FRASER ET AL.

Examiner

Qamrun Nahar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-58 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-58 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Claims 1-58 have been examined.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 6-7, 9-13, 15, 17-23, 25-34, 38-41, 43-44, 46-50, 52 and 54-58 are rejected under 35 U.S.C. 102(b) as being anticipated by “Static Correlated Branch Prediction”, Cliff Young and Michael D. Smith (hereinafter Young).

Per Claim 1:

The Young publication discloses:

- a computerized method for translating source code into object code, comprising:
recognizing a history operator and a history operand in the source code (“In this article, we present a compile-time code transformation that improves the static predictability of conditional branches. ... Each node in the history tree represents a unique observed path ... To make predictions, each node in the history tree holds a set of counters, one counter per counted edge from the predicted block. The counters record the frequencies for each of the counted edges that could be appended to the observed path to make a predictive path. In other words, the counters in a node show the frequencies with which each counted edge was traversed when the predicted

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block was reached by the observed path corresponding to that node.” on pg. 1029, par. 2, lines 11-12; pg. 1043, par. 4, lines 1-4 and par. 5, lines 1-13)

- **generating first object code that, when executed, saves a data history associated with an instance of the history operand; and generating second object code that, when executed, performs the history operator on the data history (“add_path_to_history_tree (hpath *p, hnode *n) { ... }” on pg. 1043, par. 5, lines 1-13 and pg. 1045, Figs 12 and 13).**

Per Claim 2:

The Young publication discloses:

- **wherein the first object code further saves values assigned to a variable in the data history when the object code is executed (pg. 1045, Fig. 13, “let n = c;”).**

Per Claim 3:

The Young publication discloses:

- **wherein the history operand further comprises an expression of variables and wherein the first object code further saves a result of the expression in the data history (pg. 1045, Fig. 13, “int last_edge = p->edges [p->length - 1]->succ_num;”).**

Per Claim 4:

The Young publication discloses:

- wherein generating first object code further comprises allocating storage for the data history (pg. 1045, Fig. 13, "hpath *p, hnode *n").

Per Claim 6:

The Young publication discloses:

- wherein performing the history operator on the data history further comprises: querying the data history based on contents of the data history (pg. 1045, Fig. 13, "if some child c of n is the i'th edge in p then").

Per Claim 7:

The Young publication discloses:

- wherein the history operand comprises a function and the data history comprises values returned by the function (pg. 1045, Fig. 13, "n->counts[last_edge] += p->freq;").

Per Claim 9:

The Young publication discloses:

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- wherein the history operand comprises a label associated with a source code statement, and wherein performing the history operator on the data history further comprises: counting a number of times the source code statement associated with the label was executed (pg. 1043, par. 5, lines 1-13 and pg. 1045, Fig. 12, “int *counts;”).

Per Claim 10:

The Young publication discloses:

- wherein the label is programmer-defined (pg. 1045, Fig. 12, “struct hnode” and “struct hpath”).

Per Claim 11:

The Young publication discloses:

- wherein the label comprises a programming language control construct (pg. 1045, Fig. 12, “struct hnode” and “struct hpath”).

Per Claim 12:

The Young publication discloses:

- wherein performing the history operator on the data history is a function selected from a group consisting of: summing the data history, averaging the data history, determining a

maximum of the data history, selecting an element of the data history, determining a minimum of the data history, determining a number of values in the data history, determining a first entry in the data history, determining a last entry in the data history, determining a subsequence of the data history, performing a reduction operation, and performing a statistical function (pg. 1044, par. 2, lines 5-6).

Per Claim 13:

The Young publication discloses:

- the history operand comprises a programming language keyword representing a loop;

and the history operator comprises an iteration count of the loop (pg. 1043, par. 4, lines 1-4 and par. 5, lines 1-13; and pg. 1045, Fig. 12, “int *counts;”).

Per Claim 15:

The Young publication discloses:

- wherein saving the data history further comprises: saving the data history in a linked list (pg. 1045, Fig. 12, “hnode *sib /* pointer to next sibling */” and “hnode *kid; /* pointer to first child */”).

Per Claim 17:

The Young publication discloses:

- wherein performing the history operator on the data history further comprises: resetting the data his

Per Claim 18:

The Young publication discloses:

- wherein saving the data history and performing the history operator further comprise
updating an accumulator (pg. 1043, par. 5, lines 1-13).

Per Claims 19-21, 23 & 25:

These are computer-readable medium versions of the claimed method discussed above (claims 1-3, 7 & 9, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

Per Claim 22:

The Young publication discloses:

- wherein the history operand comprises a heap-allocated object (pg. 1045, Fig. 13, "hpath *p, hnode *n").

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Per Claims 26-27:

These are computer-readable medium versions of the claimed method discussed above (claims 1 and 4), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

Per Claims 28-30:

These are computer-readable medium versions of the claimed method discussed above (claims 6, 9 and 12, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

Per Claim 31:

This is a computer system version of the claimed method discussed above (claims 1 and 4), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, this claim is also anticipated by Young.

Per Claims 32-34:

These are computer system versions of the claimed method discussed above (claims 2, 12 and 9, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

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Per Claims 38-41, 43-44, 46-50, 52 & 54:

These are another versions of the claimed method discussed above (claims 1-4, 6-7, 9-13, 15 & 17, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

Per Claims 55-56:

These are computer-readable medium versions of the claimed method discussed above, claim 1, wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

Per Claims 57-58:

These are computer-readable medium versions of the claimed method discussed above (claims 6 & 9, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also anticipated by Young.

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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5. Claims 35-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Levine (U.S. 6,349,406).

Per Claim 35:

The Levine patent discloses:

- a computer-readable medium having stored thereon a data structure, comprising: a first data field containing data representing a value associated with an instance of a history operand; and a second data field containing data representing a location within a program where the value was assigned (column 13, lines 66-67 to column 14, lines 1-13 and Fig. 10A).

Per Claim 36:

The Levine patent discloses:

- a third data field containing a timestamp representing a time when the value was assigned (column 13, lines 66-67 to column 14, lines 1-13 and Fig. 10A).

Per Claim 37:

The Levine patent discloses:

- wherein the data structure further comprises a plurality of entries for each of the first and second data fields and wherein the plurality of entries represent a history of the values

associated with the history operand as the program executes (column 13, lines 66-67 to column 14, lines 1-13 and Fig. 10A).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 5, 8, 14, 16, 24, 42, 45, 51 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Static Correlated Branch Prediction”, Cliff Young and Michael D. Smith (hereinafter Young) in view of Levine (U.S. 6,349,406).

Per Claim 5:

The rejection of claim 2 is incorporated, and further, Young does not explicitly teach that the data history further comprises program locations where the assignments occurred and timestamps indicating when the assignment was made. Levine teaches that the data history further comprises program locations where the assignments occurred and timestamps indicating when the assignment was made (column 13, lines 66-67 to column 14, lines 1-13).

It would have been obvious to one having ordinary skill in the computer art at the time of the invention was made to modify the method disclosed by Young to include that the data history further comprises program locations where the assignments occurred and timestamps indicating when the assignment was made using the teaching of Levine. The modification would be

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obvious because one of ordinary skill in the art would be motivated to determine the amount of time elapsed between each event.

Per Claim 8:

The rejection of claim 7 is incorporated, and further, Young does not explicitly teach that the data history further comprises program locations where the values were returned and timestamps indicating when the values were returned. Levine teaches that the data history further comprises program locations where the values were returned and timestamps indicating when the values were returned (column 13, lines 66-67 to column 14, lines 1-13).

It would have been obvious to one having ordinary skill in the computer art at the time of the invention was made to modify the method disclosed by Young to include that the data history further comprises program locations where the values were returned and timestamps indicating when the values were returned using the teaching of Levine. The modification would be obvious because one of ordinary skill in the art would be motivated to determine the amount of time elapsed between each event.

Per Claim 14:

The rejection of claim 1 is incorporated, and further, Young does not explicitly teach that saving the data history further comprises: saving the data history in an array, wherein each element of the array comprises a value associated with the history operand at a particular time. Levine teaches saving the data history further comprises: saving the data history in an array,

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wherein each element of the array comprises a value associated with the history operand at a particular time (column 13, lines 66-67 to column 14, lines 1-13 and Fig. 10A).

It would have been obvious to one having ordinary skill in the computer art at the time of the invention was made to modify the method disclosed by Young to include saving the data history further comprises: saving the data history in an array, wherein each element of the array comprises a value associated with the history operand at a particular time using the teaching of Levine. The modification would be obvious because one of ordinary skill in the art would be motivated to store data efficiently.

Per Claim 16:

The rejection of claim 1 is incorporated, and further, Young does not explicitly teach that saving the data history further comprises: saving the data history in a file. Levine teaches saving the data history further comprises: saving the data history in a file (column 3, lines 16-18).

It would have been obvious to one having ordinary skill in the computer art at the time of the invention was made to modify the method disclosed by Young to include saving the data history further comprises: saving the data history in a file using the teaching of Levine. The modification would be obvious because one of ordinary skill in the art would be motivated to store data for post processing.

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Per Claim 24:

This is a computer-readable medium version of the claimed method discussed above, claim 8, wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, this claim is also obvious.

Per Claims 42, 45, 51 & 53:

These are another versions of the claimed method discussed above (claims 5, 8, 14 & 16, respectively), wherein all claim limitations also have been addressed and/or covered in cited areas as set forth above. Thus, accordingly, these claims are also obvious.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
9. Any inquiry concerning this communication from the examiner should be directed to Qamrun Nahar whose telephone number is (703) 305-7699. The examiner can normally be reached on Mondays through Thursdays from 9:00 AM to 6:30 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki, can be reached on (703) 305-9662. The fax phone number for the organization where this application or processing is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

QN
August 21, 2003

A handwritten signature in black ink, appearing to read "John Chavis". The signature is fluid and cursive, with the first name "John" and last name "Chavis" clearly distinguishable.

JOHN CHAVIS
PATENT EXAMINER
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